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Is surface based setup preferable to conventional setup for breast cancer patients?

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Purpose/Objective: Common clinical practice for patient positioning during radiotherapy is to position patients according to skin marks and room lasers, so-called laser based setup (LBS). We investigated if surface based setup (SBS), using the commercially available optical scanning system Catalyst (C-rad, Uppsala, Sweden), could reduce inter-fractional setup deviations. An optical scanning system provides patient setup daily without an extra dose contribution. Our main hypothesis was that the optical scanning system could replace the lasers as a positioning tool as well as reducing the need for verification images for breast cancer patients.

Materials and Methods: Two patient groups were included in the study to enable a comparison between LBS and SBS. The breast position for the two groups was verified with a field image (MV). Clinical tolerance was a shift of 4 mm in the left-right (L-R), inferior-superior (I-S) and posterior-anterior (P-A) directions, respectively. At the treatment machine, all patients were initially positioned in supine position on a breast board (Posiboard™-2 Breastboard, CIVCO Medical Solutions) with their arms raised over the head. Twenty patients were enrolled in the first group. The patients were positioned with room lasers and verification images were acquired according to the NAL-protocol. The first three treatment sessions were excluded in the results of this study.
The second group (twenty-four patients) was positioned with SBS. Structure set and isocenter was imported from the TPS (Eclipse version 10.0.28, Varian medical systems; CA Varian), through import of the industry standard DICOM format. Correction for postures was performed with the help of a color map back-projected live onto the patients' skin and the couch shift was then given. The couch was manually adjusted and isocenter was positioned ≤2mm in the L-R, I-S and P-A directions from reference setup. The spatial vector offset (V) between planned setup and daily setup from verification imaging was calculated using the residual error (RE) in each direction, L-R, I-S, P-A according to equation (1):

$$V_{dev} = \sqrt{RE_{L-R}^2 + RE_{I-S}^2 + RE_{P-A}^2}$$

Eq. (1)

A statistical test, Students t-test for two independent mean, was performed. The null hypothesis was that there is not a difference between the two setup methods.

Results: The mean spatial vector offset was of 3.6 ±3.4 mm (1SD) for LSB and of 2.4 ± 1.8 mm for SBS ($p<0.01$). The maximum shift was 12.2 and 8.0 mm for LBS and SBS, respectively. For LBS and SBS, 73,8% and 94,1 % of the treatments sessions were within clinical tolerance.

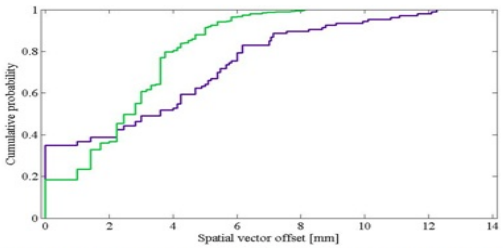

Figure 2. Cumulative probability to position a breast cancer patient within a spatial vector offset. Laser based positioning (blue) and surface based positioning (green) verified by field imaging.

Conclusions: SBS provides more information of patient postures and an easy way to correct for them with the help of the back projected color map. By introducing Catalyst as a positioning tool instead of LBS verification imaging can be reduced in the clinical routine. The SBS supplies with daily operator independent setup which improves the patient position and increase patient safety.

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A national database solution for radiotherapy quality registries and clinical studies

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Purpose/Objective: Many radiotherapy (RT) databasesare generated in the clinics in treatment planning systems (TPS) and oncology information systems (OIS). So far, much of the work to retrieve and coordinate RT-data has been done manually. Swedish quality registries for cancer are presently diagnose specific with very sparse and varying information on RT. Access to structured RT-databases and quality registries containing relevant quality parameters is necessary for efficient research, clinical evaluation and reporting.

Materials and Methods: An ITsolution designed to facilitate a national quality registry for radiotherapy is implemented. The solution consists of a local storage of DICOM RT data in a structured database, Medical Information for Quality Assessment (MIQA), and an application for recalculation of the data from the 4D representation to dose-volume parameters for each fraction. These parameters are then sent to the platform that hosts most of the Swedish quality registries for cancer, Information Network for Cancer Care (INCA). MIQA is a multipurpose system that provides data to the RT-registry and can also be used as a local quality database and research database. MIQA includes basic functionality to monitor the status of the treatment for patients in order to send only data sets for complete treatment courses. It also includes functionality to map structure names to a national standard naming convention for RT. The national quality registry for radiotherapy follows the